Questioned Documents Unit (QDU)
Procedures for Conducting Graphic Arts, Photocopier, and Printer Examinations

1 Scope

These procedures will be used by a forensic document examiner when conducting graphic arts examinations. These procedures include the examination and comparison of various office printing technologies (e.g., ink jet and toner processes) and commercial technologies (e.g., lithography and relief processes). Further, these procedures apply to the examination of photocopies, facsimiles, and/or computer printed documents for determining generational order and/or origin.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Measuring Devices (e.g., Half-Tone Screen Determiner, Linen Tester, Ruler, Grids)
- Clear acetate sheets
- Magnetic Detector

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

5.1 Using lighting and magnification sufficient to allow fine detail to be distinguished, visually examine the text and/or graphics to determine the printing technology(s) used in the preparation and printing of the submitted items. Determine the technology(s) by evaluating the printing medium, its adherence to the printing surface, and any specific technology class characteristics that may be observed such as hickeys, squeegee edges, over spray, pinholes, serrated edges, or embossing. Examples of printing process characteristics are found in Table 1. If the printing medium is determined to be typewriting, refer to the *QDU Procedures for Conducting Typewriting and Computer-Generated Text Examinations.*

Table 1: Print Process Characteristics

Impact Dot Matrix	Ribbon-inked/carbon Embossing Series of dots Stepped edges Paper fiber disturbance
Ink Jet	No ribbon Liquid medium No embossing Absorbs into paper Overspray around printed characters May have stepped edges
Laser	No ribbon (toner) No embossing Overspray over surface of paper Adheres to surface of paper Melted plastic Mounded toner beads May have stepped edges
Photocopy	No ribbon (toner) No embossing Overspray over the surface of the paper Adheres to surface of paper Edges may be smooth or serrated Toner may be magnetic Mounded toner beads Liquid (toner) Toner material suspended in a liquid carrier
Thermal	Heated wax carbon ribbon No embossing Adheres to surface of paper (can be peeled off) Serrated edges Coated paper, heat removes coating, dots

Table 1: Print Process Characteristics (continued)

Letterpress	Embossing Ring of ink (squeeze out effect)
Flexography	Little if any embossing Ring of ink (squeeze out effect)
Lithography	No embossing Even inking Smooth edges There may be hickeys
Gravure/Intaglio/Die Stamp	Serrated edges Cell pattern Raised ink surface effect
Screen	Serrated edges (sometimes) Raised effect
Thermography	Smooth edges Air bubbles/crystallization Raised (melted plastic)
Type Bar/Single Element	Ribbon carbon/fabric Embossing Smooth/round edges
Thermal Dye Diffusion	Fuzzy appearance Grid Pattern may be visible Normally coated paper substrate
Thermal Wax Transfer	Thick waxy ink creates raised texture Stepped appearance Peel-off appearance
Direct Thermal	Flat appearance Characters/Images have stepped edges Substrate thin Shiny paper Blank spots/lines possible if print head fails Discoloration Fading of substrate possible, if exposed to heat, light, scratched

5.1.1 To assist in technology determination, obtain authentic documents, or utilize standards or information that is available in the Office Equipment File for comparison purposes as necessary. Refer to the *QDU Procedures for Conducting an Office Equipment File (OEF) Search.*

5.2 Determining Common Origin

5.2.1 If the items being examined were generated using a printing technology commonly associated with commercial technologies, visually examine the items using lighting and magnification sufficient for fine detail to be distinguished for class characteristics, as well as to determine whether identifying characteristics Redacted

5.2.2 If the items being examined were generated using a printing technology commonly associated with photocopiers, facsimiles, or computer printers, visually examine the items using lighting and magnification sufficient for fine detail to be distinguished for class characteristics, as well as to determine whether identifying characteristics Redacted

5.2.2.1 Redacted

5.2.3 Redacted

Record any such characteristics by photographing either with a digital camera or using the Forensic Imaging Unit, scanning, or by any other means. Redacted

5.2.4 If a known machine is located, collect known exemplars, if applicable, by following these instructions:

- Consult with the Computer Analysis Response Team (CART), where applicable

Redacted

5.2.4.1 Redacted

5.2.4.2 If the machine is a printer:

- Print a test page.

Redacted

5.2.4.3 Redacted

5.2.4.4 Record on each exemplar the date the exemplars were obtained, the name of the person who directed the exemplars, the laboratory number, if possible, and the location where the exemplars were made.

5.2.4.5 Record for your case notes the make, model, and serial number of the machine, information about the supplies and components, whether the paper supply is sheet or roll fed, and options such as color, reduction, enlargement, zoom, mask, trim, or editor board.

5.2.5 Visually compare the items using lighting and magnification of sufficient intensity to allow fine detail to be distinguished in order to evaluate the Redacted and other class and identifying characteristics for consistencies and inconsistencies.

5.2.5.1 An overlay plotting the trash marks and/or other print characteristics and their orientation on a clear acetate sheet is often helpful when conducting comparisons.

5.3 Determining Generational Order

5.3.1 Successive copying on the same machine may make marks slightly out of register. Doubling or tripling of a pattern of dots or marks indicates at least, respectively, two or three generations of copies on the same machine. Copying on more than one device may bear the distinctive marks of all machines.

5.3.2 Visually examine the items Redacted using lighting and magnification sufficient for fine detail to be distinguished to determine, if possible, the generational order of the submitted document.

5.4 Redacted

5.4.1 Redacted

Redacted

5.4.2 Comparison cases that do not meet acceptance criteria by the USSS may be examined in QDU for orientation/arrangement of the individual print characteristics (e.g., security codes).

5.5 Documents requiring chemical Redacted examinations will be referred to the USSS to facilitate additional specialized examinations. Prior to these examinations, contact the latent print examiner to determine if preliminary latent fingerprint examinations should be conducted.

5.6 If the item is to be sent to the USSS for examination, the examiner will follow the procedures outlined in *QDU Facilitation of Document Examinations by Other Forensic Laboratories*.

5.7 Make notations in the examination records. Include any reference information, image files, printouts, photographs, overlays, or drawings of any identifying and/or eliminating characteristics observed during the examination process that will support your findings or conclusions.

5.8 Conclusions

5.8.1 Conclusions when determining whether a particular machine prepared a questioned document(s):

- **Identification -** A determination that the items were prepared by the same machine at some point in time (either directly or indirectly) due to agreement in identifying characteristics. No differences that would preclude an identification were observed. The possibility of a duplicate machine can be eliminated.

- **May Have Been Used in the Preparation and/or Printing -** A less than definite determination that a particular machine was used at some point in time (either directly or indirectly) in the preparation and/or printing of the questioned document(s). There is a correspondence in characteristics between the machine printouts and the questioned document(s); however, there is limited agreement in identifying characteristics and limitations are present. This opinion requires explanation of the limiting factors.

- **No Conclusion/No Determination -** No determination can be reached as to whether a particular machine was or was not used at some point in time in the preparation and/or printing of the questioned document(s) due to significant limitations. This opinion requires explanation of the limiting factors.

- **May Not Have Been Used in the Preparation and/or Printing** - A less than definite determination that a particular machine was not used in the preparation and/or printing of the questioned document(s) at some point in time (either directly or indirectly). There is a lack of correspondence in characteristics between the machine printouts and questioned document(s) and some inconsistencies are noted; however, limitations are present. This opinion requires explanation of the limiting factors.

- **Elimination -** A determination that a particular machine was not used in the preparation and/or printing of the questioned document(s) at some point in time (either directly or indirectly) due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.8.2 Conclusions when determining whether or not two or more documents share a common source:

- **Share a Common Source** – A determination that the items share a common source Redacted due to agreement in identifying characteristics. No differences that would preclude a definite determination were observed.

- **May Share a Common Source -** A less than definite determination that the items originated from a common source at some point in time. There is a correspondence in characteristics between the items; however, there is limited agreement in identifying characteristics and limitations are present. This opinion requires explanation of the limiting factors.

- **No Conclusion/No Determination -** No determination can be reached as to whether the submitted items originated from a common source, due to significant limitations. This opinion requires explanation of the limiting factors.

- **May Not Share a Common Source** - A less than definite determination that the items did not originate from a common source at some point in time. There is a lack of correspondence in characteristics between the items and some inconsistencies noted; however, there are limitations. This opinion requires explanation of the limiting factors.

- **Do Not Share a Common Source -** A determination that the items do not share a common source due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

5.8.3 Information related to the generational order of an item.

6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

- Redacted
- Lack of a sufficient quantity of submitted item(s).
- Prior destructive forensic examinations.
- Redacted
- Lack of sufficient clarity and detail in the submitted items.
- Lack of/limited identifying characteristics.
- Redacted

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

10 References

FBI Laboratory Safety Manual

QDU Standard Operating Procedures Manual

QDU Quality Assurance Manual

ASTM E 2389, "Standard Guide for Examination of Documents Produced with Liquid Ink Jet Technology," *Annual Book of ASTM Standards*, Vol 14.02.

ASTM E 2390, "Standard Guide for Examination of Documents Produced with Toner Technology," *Annual Book of ASTM Standards*, Vol 14.02.

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Rev. #	Issue Date	History
6	09/26/19	5.1, Table 1, added "Thermal Dye Diffusion" and print process characteristics; "Thermal Wax Transfer" and print process characteristics; "Direct Thermal" and print process characteristics. 5.2.1 added "or other print characteristics." 5.2.5.1 "and/or other print characteristics." 5.4 added "(print characteristics", "Comparisons of the orientation/arrangement of these codes may be compared in the QDU", and "and/or comparisons may." 5.4.1, second bullet added "commercial." Added "5.4.2 Comparison cases that do not meet acceptance criteria by the USSS may be examined in QDU for orientation/arrangement of the individual print characteristics (e.g., security codes)." 5.7 added "image files,"
7	04/15/21	Removed extra space in bullet six of section 2 between "Examiner" and "200". Added ", if applicable," in section 5.2.4. In section 5.2.4.1 and section 5.2.4.2 "ten" was changed to "five". In section 5.2.4.3, "at least five" was added.

Approval

Redacted - Signatures on File

Questioned Documents
Unit Chief

Date: 04/14/2021

Questioned Documents
Technical Leader

Date: 04/14/2021